DATA PROCESSING DIGEST

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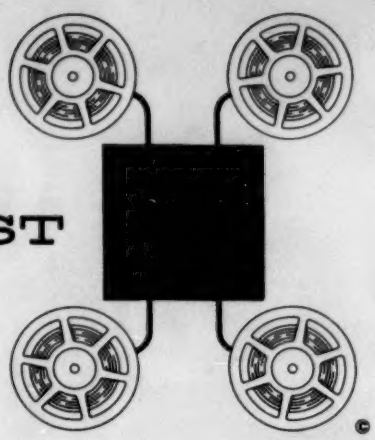

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General Information

THE ULTIMATE GOAL—I.D.P.

C. Robert McBrier, Woodward & Lothrop, Washington, D. C.
Paper presented at NRMA Retail Research Institute Conference

This paper was presented at the Retail Research Institute EDP Conference in San Francisco, February 9, 1960. The speaker presented a picture of "the ideal system to accomplish a maximum of integrated data processing, which would incorporate electronic data processing.... Would it not be desirable... for a Buyer, Merchandise Manager, Retail Analyst and E. D. P. Representative to meet to define the following:

a) Objectives of a department by stores.
b) Breadth of assortment by stores.
c) Standards to evaluate performance.
d) Resources.
e) Number of items to be controlled, either daily, weekly, or periodically. This might include the item complete through size and color classification and price line.
f) Dollar controls based upon extension of item plans.

With the items defined that are to be controlled we need to develop an identification system....

"With the above steps completed it is time to inventory merchandise and order and evaluate these in terms of our objectives. Plans would then have to be defined to adjust surplus stocks and to order those items where there is a deficiency. Records will be set up to identify merchandise and on order by the item or control group that has been defined.

"As merchandise is received it is marked with the proper identification and input into the computer record of receipts and distribution by stores. This input will update the on order and stock, both in units and dollars and will effect a payment to the resource. Items will be processed in accounting control groups and then later by item as the control is effected.

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"Let us stop at this point and appreciate the magnitude of this change. It means that we will consolidate our Invoice and Accounts Payable Office and at the time an order is written the complete description of the item will no doubt be punched on the cards and introduced into a computer. As the merchandise is received and the record of this receipt compared to the card record of what is on order, it becomes possible to update the on order, and the stock, and pay the resource.... With a card activated marking machine as has been proposed to manufacturers of marking machines, we could insure the perpetuation of the identification number into the marking ticket and it might be hoped that the record of the sale could be perpetuated again so that we have no interruption in the accurate flow of data.

Perpetuate marking ticket information

"As merchandise is sold a record of the item or control group should be captured with the identification of the customer.... With...optical scanning, this can be done automatically....and with the use of a punch card salescheck it becomes possible to identify the item on the face of the salescheck and then key punch this into the card. Other techniques, however, might include item identification captured by a tag collector, which will be come available in the very near future.... With additional rows of keys added to our registers it would be possible to introduce either the classification or item number as the amount is rung up. It then becomes possible to transcribe this information from the journal tape and this can be input into the computer. Media will be processed in accounting control groups until a balance is effected and the record of the item sale and the customer will be handled separately, with both being updated.

"Just as a basic plan was set up at the inception for the retail department, it becomes the responsibility of the Credit Manager to do the same for the customer. At the time the charge account is opened limits can be established for credit, and we have a basis for evaluation of customer activity as it relates to this limit. Exception reporting will become basic to control of both the item or control groups and the customer. It is not reasonable in fact to think in terms of control on any other basis, since volume alone renders it too expensive as well as too voluminous to handle.

Merchandise-oriented

"...the life of an item can be very accurately projected. By setting up control fields around the activity of the average item, we only have to be concerned as it breaks out of this average status, either through requiring a re-order, as the item might be identified as fast selling, or the rate of sale is so slow that it needs attention. Since there is a basic plan, we can then say that as long as the item follows this plan, it does not need separate attention. When, on the other hand, it deviates from the plan, it is identified as an exception; is reported to the Buyer, and action can be taken.

"When applying this concept to the customer, we can identify that as long as she is not exceeding credit limits and is making her payments, there is no need to give special consideration to this account,

Exception reporting

except as a basis for promotion of new business. When, on the other hand, the limits are exceeded the computer will identify this as an exception and corrective action can be taken. As payments are made, which reduce the balance to an amount that is within the plan, the exception is corrected and this account again operates within the control of the computer. Many Accounts Receivable systems are currently being developed on essentially this basis....

"With experience, machines can be programmed, not only to identify the exceptions, but they will also adjust their own programs based upon experience. We might, for example, identify a minimum level for stock in terms of an exact number. On the other hand, if we are interested in maintaining four weeks supply, it becomes possible for us, through our record of sales activity, to adjust minimum and maximum quantities."

AN INTERIM REPORT ON OPTICAL CHARACTER RECOGNITION

Henry F. Sherwood, Touche, Ross, Bailey & Smart
Presented to the NRMA Retail Research Institute

Optical Standards Committee of the NRMA was formed in August 1959 to establish standards for imprinting and optically reading saleschecks, register tapes and other documents used in retailing, and to review equipment now available and under development.

Optical preferred to magnetic for retail use

Optical scanning has been found to have advantages over magnetic ink character recognition, for the retail industry. These advantages are:

1. Field imprinting is possible with inexpensive, reliable, and easy to operate imprinters.
2. Re-entry printing is possible now, requiring only a change of type font on the printers. Re-entry printing means printing by the system of documents (such as the headers from the customers' statements) which are returned to the system as input.
3. Plastic plates may be used to create readable information.
4. Optical character recognition permits the utilization of existing equipment such as registers, printers, adding machines, etc. with minimum modification.

Critics of optical scanning point to reject rates of installations in the oil industry, but it is important to study the reasons for these rejects, and relate them to store conditions which may be quite different.

Since community plates would be used, it is important that the type font be standardized. However, the retailers in a given city would not necessarily all agree to use the same reading equipment. Therefore, if standardization cannot be agreed upon, the alternative may be to look for equipment which is able to read various type fonts.

Other problems to be solved are the design of imprinters, the thickness of plastic identification plates, and the size of the type. Smaller type faces would require thinner plates, which might not be durable.

The Optical Standards Committee has established liaison with other committees faced with similar problems. These are the Air Transport Association and the Life Insurance Automation Committee.

OFF THE MARK TO A FEASIBILITY STUDY

H. W. Matthews, Urwick Diebold Ltd.
AUTOMATIC DATA PROCESSING, February 1960; pages 16-19

This is a continuation of the article titled "When is a Feasibility Study Feasible?" in the March issue of DPD, page 8. It continues the practical suggestions for setting up a feasibility study. The first article gave some broad criteria for judging the advisability of a study. This article suggests some ways to get such a study off the ground, and away from the intertia and apathy often caused by poor direction and ill-defined purpose.

How to begin the beginning

Steps to a quick start:

1. Appoint one individual to have full responsibility for the study. He should:

   a) Have intelligence and the ability to deal with people.
   b) Have company background and be thoroughly familiar with the organization.
   c) Be high in the organization. His position should be such that if he is subsequently appointed manager of ADP it will not represent too great a promotion for him.

A detailed knowledge of computers or ADP is not a pre-requisite for the job; but a systems background is most desirable. If a qualified individual is not available in the organization it is better to recruit a good man from outside than to appoint a mediocre man from within the organization.

2. Provide terms of reference for the study. This should include: objectives, areas to be covered, basis for justification.

3. Provide training or orientation for the study team leader, to include:

   a) Potential or promising uses of ADP.
   b) Pitfalls and difficulties that may be met.
   c) A realistic notion of the costs and work involved in

an ADP program.
d) Methodology for a feasible study.

The training period should cover about six to eight weeks, followed by continued study. If a team leader is selected from outside, he should be given sufficient time for company orientation.

4. Develop a definite schedule with intermediate deadlines. Provide the necessary support in the way of time, funds, staff and authority. The schedule should provide for the following phases:

Well-outlined schedule

a) Selecting the study team members and obtaining their release.
b) Training the study team members as necessary.
c) Engaging any new staff that may be required.
d) Performing the study, with a target date for each phase or aspect of the work.
e) Preparing the report.

5. Select the study team. If the study team leader is qualified to do so he should be allowed to select his own people.

6. Appoint and orient a review group to:

a) Receive the interim reports produced by the study team.
b) Consider progress.
c) Give guidance to the study team.
d) Consider and advise on future actions.
e) Make final recommendations to the Board.

A review group of top management

The review group should consist of members of top management, representing each major department or division. The group should have a brief orientation, and should thereafter meet every four or five weeks.

7. Proceed with the study. Progress should be reviewed frequently and measured against the overall plan.

The study team should be made up of representatives of each major potential area of application. At least one member should be familiar with computers and automatic data processing. The team leader should report to a single individual high in the organization, who is a member of general management rather than a departmental executive. After the team has made the study, it will have to be disbanded. Provisions for this should be made in the very beginning. If it is decided to pursue the ADP course, the team leader should be able to assume the position of ADP manager. The team members should be aware that additional people may be brought into the program. Also they should be given assurances about their future should a computer not be acquired.

SYSTEMS PLANNING

Kevin McLaughlin, Rogers, Slade & Hill, Consultants
DATA PROCESSING, (U.S.A.), January 1960; pages 23-25

The economical use of computers must be planned on an integrated "systems" basis rather than on the traditional "applications" basis. Whether the planning is done by the company itself, the computer manufacturer, or a consultant, the following standards and criteria must be observed:

"A clear picture of the interrelated data communications requirements of all organizations units must be presented....

"A uniform format for expressing the detailed requirements of data communication documents and procedures must be provided....

"Newly developed concepts and methods for modernizing and improving the information exchange system of the entire company should be introduced....

"A high level of objectivity must be maintained in selecting, from among the various available makes, that office equipment best suited to meet the company's needs....

"A 'blueprint' and timetable for bringing the system and its components from their present state to the ideal ultimate condition must be provided."

AN INTRODUCTION TO ELECTRONIC DATA PROCESSING

Roger Nett and Stanley A. Hetzler
Published by The Free Press. 1959. $6.75

With one important exception, it would be difficult to think of a phase of electronic data processing that is not covered in an introductory fashion in this book. The authors admit that their efforts have been spent in behalf of a wide audience: the industrialist interested in applying computers to business procedures, the scientist who finds manual methods inadequate, the student who is looking for a career in the computer field, the educator who must expect to teach the subject, the administrator who knows his organization will change because of computers, and the curious reader in general. The authors write under the assumption that all of these readers are novices, and the content and organization of the book lend themselves well to this attitude.

The first chapter, which starts the book off rather slowly, gives a historical and philosophical background for the development of the electronic data processing concept. There is a glimpse of the computer as a logical development of the industrial revolution, and

some brief reflections on the social changes to be expected from widespread use of the new management tools.

The structure and use of computers

The authors then turn to the business at hand. Computers and their component parts are described; the language of the computer is discussed, with emphasis on the job of the programer; the inevitable technical explanation is included, with a chapter on gates, electrons, pulses, binary addition, etc.

Two chapters are devoted to the way in which computers may be used, in scientific uses, and in business and industrial situations. Two of the best chapters are devoted to the personnel organization for an EDP system, and the training which is necessary for programers and operators, middle management, and top management. An appendix is devoted to descriptions of computers produced by four of the larger manufacturers. An excellent bibliography and an index complete the book. The bibliography appears to be complete through 1958.

In general, this appears to be one of the better all-inclusive introductions to this complex subject. However, we have two points of criticism. One is that, while the intent is to provide an easily-read book for the novice, the style frequently becomes pedantic and difficult to follow. The other is the lack of adequate information about automatic programing. At this stage of development, we feel this is a serious deficiency.

COMPUTERS AND PEOPLE

John A. Postley
Published by McGraw-Hill Book Company. 1960. $6.00

Both the intent and the form of this book are in complete contrast to the one reviewed above. In the author's words, it is not a "how to" book, but rather attempts to look behind the how at the why which dictates it. It is directed toward those people who are in business, especially in the management end. It is also the author's hope that it will be of interest to the college student "whose specialization does not specifically involve the use of computers" and of value to those who are being trained to design and use computers. Finally, the author hopes that the curious layman will find the book informative and interesting.

It is our feeling that any of the above audiences may benefit from the book, but that all too few will come to it with the required frame of reference or openness of mind to "get the message." This discouraging state is anticipated by the author when he says, "People are rarely interested in computers because they know that the machines will open the door to the entirely new techniques of business operation and control which are so vitally needed in our increasingly complex business society." Rather, he says, they like computers because "they are modern, or mysterious, or prodigious, or because

Glamor and economy are poor reasons

they think they save money (which they rarely do)." Such an attitude toward an expensive computer installation is bound to hamstring the computer's ability "to bring to bear additional and pertinent facts, either directly or according to some limiting criteria.... The question, 'What, more than an increase in speed and accuracy, does this computer application represent?' should be posed with respect to every computer application."

"The development of a present strategy of business activity must precede the design of a large-scale electronic data processing system intended to implement that strategy." This seems obvious, but there is many a hastily contrived payroll application in EDP history to prove that management has yet to learn its real purpose in the business organization. The author estimates that in 75 per cent of the cases, neither top management, middle management, nor the "working-level" people clearly understood the real objectives of installing an electronic data processing system.

These brief excerpts give some idea of the philosophical, but highly practical, tone of the book. It would behoove many a "feasibility" committee to spend its first meeting, each member alone in his own office with a copy of "Computers and People." The chairman might see that the top management has a copy, too.

CYBERNETICS AND MANAGEMENT

Stafford Beer
Published by John Wiley & Sons, Inc. 1959. $4.50

Cybernetics is a comparatively new branch of scientific inquiry, defined by the author as "the scientific study of the nature of control, ... in the subtle sense of self-regulation and adaptability." He suggests that management might be called the profession of control. Cybernetics appears to embrace at least parts of the field of activity of electronic data processing, and in this connection, this book might be of interest and value to many in the EDP field. This is not an easy book for non-scientifically oriented persons to read, but it does provide an interesting glimpse of a developing scientific discipline.

EARLY EXPERIENCES WITH AN E.D.P. SYSTEM

T. C. Hickman, Unilever Ltd.
THE COMPUTER JOURNAL, January 1960; pages 152-163

Unilever is a collection of individual companies which produce and sell a variety of products, including soap, soap powders, cooking fats, ice cream, canned and frozen foods, cattle feed, and many others. The company installed an Elliott 405 electronic data processing system in 1957. The philosophy of the company was that they would not expect

a saving on their investment for at least three years, and that the machine would be used in a research sense. That is, any of the systems processed by the computer would be processed on an experimental basis, with the idea that they would provide experience in the use of the computer. The first applications were: clerical payroll for 1800 employees, sales transactions (to test the potentialities of using the computer for sales statistics and forecasts), and linear programing problems, especially the problem of finding the most economical mixture of raw materials to make a cattle food.

Ten programers were selected and trained, nine of them from within the company. Four of these were from the company's Internal Audit Department. About half of the men had mathematical qualifications; the other half had commercial qualifications. These senior programers are responsible for the entire job--systems study, flow charting, coding, testing and debugging. Part of the routine work has now been turned over to four assistant programers.

Management training class yielded some applications

Some of the most interesting and important applications being prepared for the computing system came from management personnel who attended one-week courses on the computer before it was installed. One of these is market research, in which analyses are made of Readership Surveys to find the best expenditure of advertising money in newspapers and periodicals. Some important programs resulting from the management courses are those written for the Statistical-Service Unit of the Food Research Department, which carries out experimental work such as horticultural experiments on food plants, nutritional tests on animals and poultry, taste-panel results on food products, bacteriological tests, etc. In addition, the computer is being used for a complex buying and selling operation of the United Africa Company, an associated company.

An interesting aspect of the payroll application is that the company is now processing the clerical payroll on a credit-to-bank basis, following the policy long before established for the company's executive payroll.

MAGNETIC INK GOES TO WORK

Craig G. Ford, Mellon National Bank, Pittsburgh, Pa.
AUDITGRAM, February 1960; pages 30-32

Banks should be planning for check encoding now, even though they do not contemplate having automatic check handling procedures for some time. They are reminded that some companies are ready to order a year's supply of checks, and if they do not help them order checks which have the MICR specifications, their customers will still be using old checks in 1961. "By that time pressures for progress from customers, from competition, and perhaps even from the Federal Reserve System will be pushing you hastily into encoding. If you can act soon, you and your customers will be among the first to benefit from automatic check handling."

Criticism of pioneering automatic banking has been of two kinds:

1. The need is one which exists mainly in large banks and the Federal Reserve System. The answer to this criticism is that "every bank is plagued with rising costs and unreliable, short tenure personnel, and every bank is faced with a fierce struggle for the depositor's dollar."

2. Only banks and the banking industry stand to gain from this program. The answer to this criticism is that "by the utilization of electronics we hope to provide... [increased customer] services without inflationary price increases.... We must take steps to prevent the inevitable, complete, and chaos-causing breakdown of the American check collecting system. The related gains are far less significant to the bank customer than the preservation of an efficient, economical check clearing operation."

AUTOMATION IN THE OFFICE

OFFICE MANAGEMENT, January 1960; beginning page 13

A general review of automation in the office is given in a series of articles, along with a prediction of advancement in the sixties. The articles include: "Total" Integration Through Automation Foreseen as Major Advance of Sixties; Three Automation Milestones of the Past Decade; High-speed Photomemory Units Could Supply Automation's Second Dimension.

NATIONAL INFORMATION CENTRE ON AUTOMATIC PROGRAMMING

AUTOMATIC DATA PROCESSING, February 1960; page 36

The department of mathematics of Brighton Technical College (Brighton, England) has established a National Centre of Information on Automatic Programming of Digital Computers. "The purpose of the centre is to establish and maintain a comprehensive library of publications, papers, research reports and other material, especially material that is not readily accessible, in any way relevant to the problems of automatic programming, and to make these available on demand, in English. The centre will also publish an annual review of automatic programming and provide a clearing house for information and enquiries. It will help to co-ordinate the work of other bodies active in the same field. It will organise small working conferences on particular aspects of automatic programming, and will keep permanent contact with organisations throughout the world."

HOW MUCH CAN MACHINES LEARN?

Andrew Booth, Birkbeck College, University of London
AUTOMATIC DATA PROCESSING, February 1960; pages 22-26

Not much, at the present time, says the author. In a recital of the first practical attempt to educate a machine without initial programing assumptions which was made by R. M. Friedburg in 1958, it took nearly a quarter of a million trials for the computer to produce three successful repetitions of the logical "and" function. The test was performed by generating random numbers which could be interpreted by the machine as instructions. Criteria for reward and punishment were divided to "encourage" the machine to perform simple functions of the type: "Generate the result of the logical operation 'a and b' where a and b are the binary numbers zero and one."

The author believes that "it seems quite certain that vast numbers of repetitions will be required if machines are to learn on their own. Furthermore, our present understanding of the types of inbuilt unit logical operations which can lead most efficiently to learning on the part of the machine is at present very limited indeed."

Experiments which simulate the behavior of neural nets, paralleling the natural process of the brain, are based on fundamental assertions concerning the way in which neurons interact. None of these accomplishments has approached "the miracle of even the newborn human brain."

Management Sciences

OPERATIONS RESEARCH

James H. Batchelor
Published by St. Louis University Press. 1959. $10.00

Here is a massive bibliography of 4195 books and articles in the field of operations research through 1957. The majority are annotated. References are listed alphabetically by author, and numbered for an extensive cross-reference index which has about 12,000 entries in a single alphabetical list giving joint authors, titles, and subjects.

Applications

NIAGARA MOHAWK—ELECTRONICS FOR ITS FUTURE

MANAGEMENT AND BUSINESS AUTOMATION, February 1960; pages 14-18, 32

Niagara Mohawk Power Co. has about 1,400,000 electric and gas customers, with an additional customer list of 30,000 annually. About 70 percent of the total are billed monthly, the remaining group bi-monthly. The customer accounting is being placed on an RCA 501.

Pre-punched mark-sensing meter reading cards will be used. Their sequence numbers will be recorded in the computer memory three days in advance of a scheduled meter-reading day. These numbers will then be assigned to the magnetic tape which contains the data for preparation of the meter reading cards. The sequence numbers on the tape are spot checked against the meter reading cards for accuracy. After the meters have been read, the cards are processed, and the information is transferred to magnetic tape. The computer sorts the entries into sequence number order, and prepares a new billing tape. The customer bills are punched cards with stub attachment, containing pre-punched serial number. As the bills are printed a second tape is recording the number, total gross and net amount of the bill. This tape will be used to reconcile the cash payments.

Payments are received in district offices and divided into regular payments and irregular transactions (no stub, or mutilated stub). Stubs are mark-sensed to indicate payment, batched, and preceded with a balancing stub. At the data processing center the stubs are processed (irregular stubs are manually keypunched), and converted to tape for computer entry. Using sequence numbers for control, the computer applies the correct cash payment to the open items on the tape prepared during the billing operation. Ten computer runs will be required, but the master file will be used only three times; for billing, for discount review, and for file maintenance.

THE ANATOMY OF EDP IN BANKING

Herbert R. Corey, The First National Bank of Boston
PAPERWORK SIMPLIFICATION, First Issue 1960; pages 4-6

The First National Bank of Boston used the total systems approach in planning for their Datamatic 1000 computer system. All applications were reviewed for conversion to a single computer system. The system is planned to encompass the deposit accounting, loan accounting, and corporate trust functions.

The first application was deposit accounting. Thirty thousand special checking accounts were at the time being processed on tabulating equipment. It was decided to convert the punch card system to the computer system in order to obtain experience in using the computer before attempting to convert the remainder of the checking accounts. These will not be converted until automatic check-handling equipment is installed. In the two- or three-year interim, the bank is developing its account numbering system.

Automatic credit decisions and one file for all loans

In loan accounting, the master record will contain data which supports automatic decisions on credit lines for each account and which can be related to various sales and product studies for the borrowing customer. Other loan categories being converted to computer processing are commercial, mortgage and commodity loans, unsecured installment loans, and a new revolving credit plan. File maintenance for all loans will be accomplished in a single computer run, regardless of category. A central liability record will give immediate data on all lendings to an individual borrower, as well as a flexible capacity to report out statistical analyses showing seasonal, industry, geographic and consumer trends.

The corporate trust application has converted 902,000 stockholders' records to magnetic tape. They are coded by the Name Code account numbering system ((see DPD, November 1959, page 12)).

INCENTIVE PAYROLL AND LABOR EFFICIENCY DATA

A. A. Meyer, Carter Carburetor Division, ACF Industries
DATA PROCESSING, (U.S.A.), January 1960; pages 11-13

The Carter Carburetor Division uses an IBM 305 RAMAC to obtain labor efficiency comparisons from their complex incentive payroll.

"In an average day, at least 5000 individual records are created on the performance of some type of direct or indirect labor. In one week it is possible to generate and use more than 30,000 records reflecting labor expended on any one of 50,000 specific production operations, more generally identified in terms of 3000 work hours.

"From these source records we derive wages, labor distribution, labor standard cost and variances (which in turn affect inventory), departmental earned hours, and work order cost control and distribution. In short, they affect every accounting and recording function in which labor is the common denominator."

The way in which group incentive figures are computed is given in detail. Other reports produced by the computer are: Group Scrap Charge-backs and Payroll Scrap Charge-back Deductions, Employee Total Wage and Check cards, Indirect Labor Record Cards, and Departmental Standard Direct Labor Records.

COMPUTER SPEEDS ORDER PROCESSING

MODERN RAILROADS, February 1960; page 77

Alco Products, Inc. is a major railroad supplier with regional warehouses in North Bergen, N. J., St. Louis, and Los Angeles. The company has installed an IBM 305 RAMAC for inventory control and order processing. The warehouses retain the responsibility for quotations, processing of orders for transmission to the computing center at Schnectady, order status inquiries, and receiving, storing, and shipping parts in accordance with control-center instructions. Each warehouse also guides its inventory coverage and levels to meet its requirements. All information for maintaining their records are forwarded by the warehouse to the center at Schenectady, via Teletype printer and tape. The center prepares invoices and all papers required to fill an order, directs filling of orders from each warehouse, prepared daily lists of items that require expediting, and flag items at reorder point. Routine orders are handled within 24 hours, emergency orders within minutes.

NO-PASSBOOK SAVINGS WITH SEMIAUTOMATED POSTING

AUDITGRAM, February 1960; pages 34, 35

The First Granite City National Bank of Granite City, Illinois, is using a Burroughs Electronic Bank Bookkeeping Machine for its no-passbook savings plan. Teller machine validated receipts are presented for deposit and withdrawal transactions. Each depositor is provided with a plastic identification plate, and imprinting machines are placed in the bank's lobby for customer use. At the end of every six months interest is credited to statements which are microfilmed and mailed to customers.

CITY LOOKS TO AUTOMATIC TRAINS

RAILWAY AGE, February 1, 1960; page 19

San Francisco Bay Area rapid transit plans include control by electronic computers, which will be programed to analyze all factors affecting transit patronage and formulate train schedules based on the analyses. A computer will work out the makeup and dispatch plans of trains, and once a train enters the control system, it will be regulated by trackside and station control equipment which will control speed, halt a train at a specified point on the station platform and cause it to leave the station after a specified interval. In case of delays, computer equipment will automatically reschedule trains to minimize effects of the delay.

Programing

MULTIPROGRAMMING STRETCH: FEASIBILITY CONSIDERATIONS

E. F. Codd, E. S. Lowry, E. McDonough, C. A. Scalzi, IBM Corp.
COMMUNICATIONS OF THE A.C.M., November 1959; pages 13-17

Parallelism in computer design means the concurrent execution of instructions. Formerly this doubling up was confined to neighboring instructions. More recently, the doubling up has been accomplished in entirely separate programs being processed in the same machine. To do this, the computer must have "a number of connected facilities, each capable of operating simultaneously (and independently, except for memory references)...."

Dangers in multiprograming

Multiprograming gives rise to several problems. One example is the possibility of one program making an unwanted modification in another because of a programer's blunder. Another example is the difficulty in defining the source of an error; it could be machine malfunction, a programing error, or an operator error. It is necessary to find which program has been affected, and which program (if any) was responsible. For these reasons, a set of conditions must be established for a multiprograming system:

a) The multiprograming scheme should permit programs to be independently written and compiled.
b) The programer should not be required to provide any additional information about his program for it to be run successfully in the multiprogramed mode.
c) Any necessary controls in the system beyond the programer's direct influence must be held to a minimum, and must cause no reduction in the effective logical power available to the programer.
d) No program should be allowed to introduce error or undue delay into any other program (for example, unplanned loops).
e) The multiprograming scheme must assume the burden of the added operating complexity.
f) Allocation of storage space, assignment of input-output units, and control of time-sharing should be based upon the needs of the programs, rather than upon a rigid subdivision of the machine.

STRETCH features

All of the above requirements are met in the STRETCH system. Here are four features in STRETCH which facilitate multiprograming:

1. Program Interruption System permits interruption of a sequence of instructions whenever the four following conditions are satisfied:

a) The interruption system is enabled.
b) No further activity is to take place on the current instruction.
c) An indicator bit is on.
d) The corresponding mask bit is on.

2. Interpretive console, treated as input-output device, is not directly connected to the STRETCH central processing unit.

3. Protection System allows any number of programs sharing memory to be effectively protected from each other.

4. Two clocks in STRETCH are usable by programs. The first, "elapsed time" clock, may be read by a program under certain conditions but cannot be changed by a program under any condition. The second clock, "interval timer," may not only be consulted but may also be set to any desired value by a program. The main purpose of this device is to provide a means for imposing time limits without requiring programed clock-watching.

UNCOL, UNIVERSAL COMPUTER ORIENTED LANGUAGE REVISITED

T. B. Steel, System Development Corporation, Los Angeles
DATAMATION, January-February, 1960; pages 18-20

Those who are seeking a common language for computers realize that the task is made difficult by the fact that the more suitable a language is for people, the more difficult the translation process becomes. The programing problem divides into two levels: 1) the problem language level, and 2) the machine language level, with a special type of program, a compiler, to join the two. The big difficulty has been to find a problem language which is acceptable to all concerned. Since it is not likely that such a language can be agreed upon, another approach is considered by some to be the answer.

Link between problem and computer

This is the concept of UNCOL--Universal Computer Oriented Language. This is the "interposition of a third kind of language between the level of problem oriented languages, POLs, and the level of machine languages, MLs. This third level is assumed to consist of a single language, UNCOL, which has the character of a generalized machine-like language.

"The operating procedure is now the following: Each problem language is transformable into UNCOL and UNCOL is transformable into each machine language. Given a problem described in a POL, processing through a program, called a 'generator,' specific to the given POL, results in a transformation of the problem statement from its POL form to an UNCOL form, which is independent of the machine which will actually solve the problem. Now, selecting a specific machine,

independent of the original POL, processing the problem in its UNCOL form through a program, called a 'translator,' specific to the given ML, results in a transformation of the problem from its UNCOL form to a ML form."

As each new computer is produced, "all that will be necessary in the way of preparatory programing is the construction of a single translator to convert UNCOL to the new machine language.... As each problem oriented language is invented, all that is required to make the language generally available is a single generator to convert the problem language to UNCOL.... The UNCOL system will enable any computing installation to use its current programs on any machine without additional delay...."

The UNCOL system is being studied by members of a SHARE committee.

Equipment

THE MULTI-DIMENSIONAL LARC

UNIVAC REVIEW, Fall 1959; pages 23-27

The Larc operates at faster speeds than most existing computers; for instance, access time for one word is 4 microseconds. It is modular in concept, allowing the user to select a system to meet immediate needs and providing for future expansion. A basic Larc might include a Computer for high-speed arithmetic and logical computations, and a Processor for handling input-output and "secondary" computing operations. In an expanded system, a second Computer may be included.

Supporting the computing units is a high-speed data storage system, composed of magnetic ferrite-core and magnetic drum storage units. The storage may be expanded to a capacity of more than 73 million decimal digits of information. The input-output units include magnetic tapes, high-speed punched-card input, output printers which produce printed lines at a rate of 600 per minute, and page recorders which record an entire page at a speed of 10,000 lines per minute. The magnetic tapes are compatible with tapes used by Univac I and II and with the other Univac data-conversion devices.

Computer and Processor are controlled separately

The Computers and the Processor are controlled by separate programs, and operate cooperatively and independently with little direct communication. The two Computers in an expanded system can be programed to solve a single problem jointly, or each Computer can solve independently one or more separate problems. The Processor accommodates the input-output, and auxiliary storage needs of both Computers. It can also perform any necessary editing of output data.

If input-output demands are not excessive, the Processor can also perform sorting, merging, and other operations simultaneously with the Computer programs.

Cooperation between Computer and Processor

Any part of core storage not being used by the Computer can be used as an input-output buffer without slowing input-output data transfers for the Computers. Since the Computers and the Processors have access to the same storage, they can alert one another to the presence of information in a particular part of storage. This permits an almost limitless degree of cooperation between them. The Computer can cause the Processor to transfer data between the main storage and drum storage which has the capacity, speed and reliability to keep abreast of the unusually high computing rates of the system.

The on-line equipment consists of: Magnetic Tape Read-Write Units, Electronic Page Recorders, On-Line High-Speed Printers, a High-Speed Card Reader, Console Typewriter-Printers. Off-line equipment includes: Univac High-Speed Printer, Unityper II, Tape Verifier, Punched Card-to-Magnetic Tape Converter, Magnetic Tape to-Paper Tape Converter, and Bi-Directional Paper-to-Magnetic Tape Converter.

Each of the storage and input-output units of the system is designed for off-line maintenance, while the remainder of the system is operating. The tape, drum and core storage units are connected into the system by means of plugboards which make it possible to quickly substitute one unit for another of the same type. The Larc sells for six million dollars or more, and rents from $135,000 a month.

AUTOMATIC TEACHING MACHINE

THE OFFICE, February 1960; pages 132, 134

The Automatic Tutor has been developed by Western Design Division, U. S. Industries, Inc. The machine locates and presents any selected information, up to 10,000 items, through its keyboard. It questions the student, corrects him if he is wrong and expands on the material, or congratulates him if he is right; then moves him along to the next area of material to be learned. A film bank in the machine accommodates up to 10,000 35mm frames with automatic sequence and projection apparatus, selector buttons, viewing screen and tape printing mechanism to record the student's progress. Doubleday & Co. will publish a series of books on a variety of subjects for use with the automatic teaching system.

COMPUTER RESCUES THE VOTING PROCESS

CONTROL ENGINEERING, February 1960; pages 65-69

Los Angeles County is acquiring a special ballot-counting machine being designed by Norden Division of United Aircraft and Gyrex Corp. The familiar 24" x 30" ballots can be handled and counted by the machine at the rate of 600 ballots per 30 seconds. The machine was designed to account for ballot skew, so that perfect alignment of ballot feeding is not critical.

Comment

THE EVANS TABLE—A PROCEDURE-ORIENTED LANGUAGE

The definition of a data processing procedure requires three well-recognized major steps:

1. Determination of requirements.
2. Precise definition of procedures to fulfill the requirements.
3. Preparation of instructions to the data processing facility to accomplish these procedures.

To date the analytic tools for step 2 have been missing. It has been necessary to express the precise procedure in terms of a process, that is, in terms of a procedure for some particular processing facility. Even the so-called "problem-oriented languages," such as AIMACO (DPD, July 1959, page 1 and August 1959, page 15) and COBOL (DPD, February 1960, page 14), while extremely useful, are actually process oriented. These languages essentially permit the applications engineer to define procedures in terms of a process for a hypothetical computer that has easily understood instructions such as TRANSFER FROM A TO B, rather than obscure machine codes, such as RAL Y0001, SLO T0001, etc. But this approach is still a process, principally because it still implies a sequence in which instructions must be performed.

Process-oriented languages assume a computer instruction sequence

A tool for describing procedures independent of process and of sequence has been developed. The technique depends upon the recognition that a data processing procedure is always carried out in two steps:

1. Recognition of the conditions that exist, e.g., is gross-pay-to-date greater or less than $4500, (a condition) and
2. The execution of a data manipulation, e.g., form: (Net pay) x .03 (an action).

These two steps are spelled out, for a given procedure, in a tabular form shown in Table I[1]. The left side of the table (which we will call the Evans Table after Orren Evans, the first to describe this approach) names the conditions (top row) and, below, states the various combinations of conditions which can exist. The right side of the Evans Table describes the action to be executed for the various combinations of conditions.

Evans Table defines the procedures

TABLE I
Conditions for a Simple Payroll Calculation

Condition / Rule #	Hours = 0?	Hours >40?	Night Shift?	Action	Then go to next Table, No.:
1	No	No	No	Net pay=Hrs x Rate	2
2	No	No	Yes	Net pay=Hrs x (Rate+.05)	2
3	No	Yes	No	Net pay=[Hrs+.5(40-Hrs)Rate]	2
4	No	Yes	Yes	Net pay=[Hrs+.5(40-Hrs)] [Rate + .05]	2
5	Yes	No	Any	Appropriate exception action	3

Many refinements in the use of tables are being developed, including methods of repeating parts of the procedure, methods of taking advantage of the fact that some combinations of conditions occur more frequently to reduce processing time, methods of sequencing from table to table, etc.

The advantages of tabular descriptions of procedures are:

1. The description is independent of the processors; it can apply to clerks or computers.
2. It forces precise definitions of conditions.
3. It forces the analyst to be precise; to examine all relevant combinations of conditions and to define an action (even if only an error report) for each possible combination of conditions.
4. It is easily read (with little practice) and therefore easily checked by the user, as opposed to the problem of tracing flow charts.
5. A standard for communication among EDP systems designers is, at last, available.

We feel that the concept of representing procedures in this Evans Table form is a significant advance in the data processing field.

1. This Comment is based in part on the work of Orren Evans, of Hunt Foods (Fullerton, Calif.), as presented to the CODASYL Systems Subcommittee on January 19, 1960. To date, the details of the procedure have not been published.

Training

Management Concepts in Operations Research, presented by Harvey N. Shycon Company

Date: May 2-4, 1960
Place: Boston, Mass. (Harvard Club)
Fee: $200
Information: Harvey N. Shycon Company, Park Square Building, Boston, Massachusetts

Advances in Management Information & Reporting Systems, Special Forum sponsored by American Management Association

Date: May 9-11, 1960
Place: New York City (Biltmore Hotel)
Information: American Management Association, 1515 Broadway, New York 36, New York

University of Michigan Summer Courses, 1960, a program of intensive non-credit courses for practicing engineers and scientists including electronic data processing

Dates: June 13-24, 1960
Place: Ann Arbor, Michigan
Information: R. E. Carroll, Coordinator, Engineering Summer Courses, 2038 East Engineering Building, The University of Michigan, Ann Arbor, Michigan

Cornell University Industrial Engineering Seminars

Date: June 14-17, 1960
Place: Cornell University, Ithaca, New York
Subjects: Industrial Management, Engineering Administration, Operations Management of the Smaller Company, Work Measurement, Systems Simulation Using Digital Computers, Statistical Decision-Making: Theory and Applications, Statistical Reliability Analysis: Theory and Applications
Information: J. W. Gavett, Seminars Coordinator, Department Upson Hall, Cornell University, Ithaca, N. Y.

EDP Installations in Operation--A Conducted Tour of Practical Applications, sponsored by San Diego State College

Date: August 8-20, 1960
Place: Tour starts at San Diego State College and includes Los Angeles, and vicinity, San Francisco, and vicinity, with sightseeing stops at Sequoia and Yosemite.
Content: Visits to large and small computer installations and computer manufacturers. Persons without automation background can benefit, as well as those who are familiar with the subject.
Fee: $135 plus meals (including bus fare and accommodations)
Course requirements: Credit for Upper or Graduate Division status. For audit: college matriculation and consent of instructors
Registration: Before July 1, 1960.
Information: Dr. E. Dana Gibson, Professor, Office Management, San Diego State College, San Diego 15, California

Meetings

TIMS-ORSA West Coast Meeting
Date: April 7, 8, 1960
Place: Monterey, California (U. S. Naval Postgraduate School)
Information: Daniel Teichroew, Stanford University, Stanford, California

Western Joint Computer Conference
Date: May 3-5, 1960
Place: San Francisco, California (Jack Tar Hotel)
Information: Box 214, Station A, Palo Alto, California

A. I. I. E. National Conference
Date: May 12-14, 1960
Place: Dallas, Texas (Sheraton-Dallas Hotel)
Fee: $47.50, members; $57.50, non-members
Information: American Institute of Industrial Engineers, P. O. Box 914, Irving, Texas

Insurance Accounting and Statistical Association Annual Conference and Business Show
Date: May 15-18, 1960
Place: Chicago, Illinois (Sherman Hotel)
Information: I. A. S. A., P. O. Box 139, Kansas City 41, Missouri

New Dimensions for Office Executives, NOMA International Conference
Date: May 22-25, 1960
Place: Montreal, Quebec, Canada (Queen Elizabeth Hotel)
Information: National Office Management Association Willow Grove, Pennsylvania

Automatic Computing and Data Processing in Australia, Conference sponsored by The Australian National Committee on Computation and Automatic Control
Date: May 24-27, 1960
Place: Sydney (University of Sydney and University of New South Wales)
Information: C. H. D. Harper, c/o The Institution of Engineers, Science House, 157 Gloucester Street, Sydney, N. S. W., Australia

Western Systems Conference, sponsored by Systems and Procedures Association Chapters of Southern California
Date: May 26, 1960
Place: Los Angeles, California (Statler Hilton Hotel)
Information: George Ryan, 6986 Bandini Blvd., Los Angeles 22, California

Conference, The Computing and Data Processing Society of Canada
Date: June 6, 7, 1960
Place: University of Toronto
Information: J. H. Aitchison, 600 Eglinton Ave., E. Toronto, Ontario, Canada

National Machine Accountants Association National Conference

Date: June 22-24, 1960

Place: San Francisco, California

On Tuesday, June 21, a pre-conference tour will be conducted to outstanding data processing centers in nearby areas. In addition to the regular meetings, a Hall of Discussions will be held during the conference which will feature questions of general interest discussed informally. Following the conference, registrants may continue to Honolulu for a two-day meeting beginning on Monday, June 27, featuring data processing experts from the Pacific Basin and Asia.

Information: Address inquiries to 1960 National Conference, NMAA, P. O. Box 3617, Rincon Annex, San Francisco 19, California

Conference, British Computer Society, Ltd.

Date: July 4-7, 1960

Place: Harrogate, Yorks, England

Information: Miss D. E. Pilling, Electronic Computing Laboratory, The University, Leeds 2, England

Symposium on Computers and Data Processing, sponsored by University of Denver

Date: July 28, 29, 1960

Place: Estes Park, Colorado, Stanley Hotel

Information: W. H. Eichelberger, Denver Research Institute University Park, Denver 10, Colorado

National ACM Conference

Date: August 23-25, 1960

Place: Marquette University, Milwaukee, Wisconsin

SHARE XV Meeting

Date: September 12-16, 1960

Place: Pittsburgh, Pa. (Pittsburgh Hilton Hotel)

Information: E. B. Weinberger, Gulf Research & Development Co., Drawer 2038, Pittsburgh 30, Pa.

NABAC National Convention

Date: October 10-12, 1960

Place: Los Angeles, California

Information: NABAC, The Association for Bank Audit, Control and Operation, 38 South Dearborn St., Chicago 3, Illinois

International Systems Meeting, sponsored by Systems and Procedures Association

Date: October 10-12, 1960

Place: New York, N. Y. (Hotel Commodore)

Information: Systems and Procedures Association, 4463 Penobscot Building, Detroit 26, Michigan.

References

DATA PROCESSING DIGEST does not provide copies of the original material digested or reviewed in this issue. The publishers addresses are listed below for your convenience in writing to them for more complete information.

Auditgram
38 S. Dearborn St.
Chicago 3, Illinois

Automatic Data Processing
Mercury House
109-119 Waterloo Rd.
London SE 1, England

The Computer Journal
The British Computer Society
Finsbury Ct., Finsbury Pavement
London EC 2, England

Control Engineering
330 West 42nd St.
New York 36, New York

Data Processing (U.S.A.)
956 Maccabees Building
Detroit 2, Michigan

Free Press
Glencoe, Illinois

Management & Business Automation
600 West Jackson Blvd.
Chicago 6, Illinois

McGraw-Hill Book Co. Inc.
330 West 42nd St.
New York 36, New York

Modern Railroads
201 North Wells St.
Chicago 6, Illinois

NBS Technical News Bulletin
Supt. of Documents
U.S. Gov't Printing Office
Washington 25, D. C.

NRMA Retail Research Institute
100 West 31st St.
New York 1, New York

The Office
232 Madison Avenue
New York 16, New York

Office Magazine
319 High Holborn St.
London WC 1, England

Office Management
212 Fifth Avenue
New York 10, New York

Railway Age
30 Church Street
New York 7, New York

Research for Industry
Stanford Research Institute
Menlo Park, California

St. Louis University Press
St. Louis University
St. Louis, Missouri

Univac Review
315 Fourth Avenue
New York 10, New York

John Wiley & Sons, Inc.
440 Fourth Avenue
New York 16, New York

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